

In Defense of Cybernetics. A Reminiscence¹

One cannot speak of defense without also speaking of cybernetics. From a historical point of view, it recommends itself as the science of defense *par excellence*, and in two respects. On the one hand, it owes its modern form essentially to the air defense systems of World War Two, i.e. automatic target prediction and enemy tracking. Peter Galison was right in particularly emphasizing this point and developing it into a broad contemporary-history diagnosis (Galison 1994). On the other hand, however, the question of system stabilization, the establishing of dynamic balances, can also be seen from the perspective of defense. After their being modeled, by which the relevant factors for their regulating activity is determined, cybernetic systems stabilize themselves through continuous defense against everything that might constitute a threat to their continuity. Cybernetic systems are constantly threatened with destabilization and constantly legitimized by defense. Hence, perturbation constitutes their right to exist, and defense appears as a positive force. Perturbation is what causes a permanent need for intervention, and defense is what permanently fulfills it. Therefore, cybernetics is to be characterized as a technical as well as a political science. And this brings back into focus that cybernetics – long before its neurologically and computer technologically inspired reinvention towards the end of WW II – has a double origin. In Greek antiquity, it means technology and politics at the same time: it designates both procedures of controlling missiles and procedures of controlling history; it names the control of material things and of historical events; it repels intruding enemies and adverse conditions, in both cases maintaining a paradoxical relationship with the future.

In technology, battleships after the model of the »trireme« allowed ancient Athens to establish its hegemony in the Eastern Mediterranean, thus providing an idea of what an aggressive market economy is capable of. The tactical operative use of the trireme required of the helmsman and the commander the compliance with various variables: The performance of the ship had to be calculated in consideration of the actions of an intelligent enemy in order to steer for the point at the bow of the enemy vessel where it could be hit with the ram. Thus, the ship was a guided projectile, steered into the enemy by the *kybernetes*. The crucial variable of the ship's speed basically depended on the dryness of the hull and the tiredness of the crew, who had to gain as much acceleration as possible by rowing before the ramming. (Pircher 2004) One cannot but notice here the similarity to the problems Norbert Wiener had with air defense. He, too, had to take an intelligent enemy into account who, as a pilot, would try to escape the flak by changing his flight behavior, thus forcing the anti-aircraft gun's computer to adjust the projectile's direction and time of detonation accordingly. In the same way, the *kybernetes* of a trireme already had to adjust his steering to the evasive maneuvers of an enemy ship in order to hit it as close to amidships as possible.

As far as history is concerned, suffice it to recall what is probably the most prominent narrative of the failure of cybernetics. Palinurus, Aeneas' helmsman, fell into the sea in a storm sent by the Gods. Before that, Morpheus had covered his eyes with some drops of water from the river Lethe to the effect that he was overcome by sleep while steering and was washed overboard by the waves. Later, Aeneas descends to Hades and meets Palinurus again. Upon asking him about the details of the accident, he learns that the Gods' attack against him was *not* aiming at thwarting the prophecy that Apollo had issued about Aeneas reaching his goal without damage.

¹ A shorter German version of this text was published as »Die Herrschaft der Sozialmaschine«, in *Frankfurter Allgemeinen Zeitung*, March 13, 2004, followed by an elaborate analysis entitled »Der Auftrag. Kybernetik und Revolution in Chile«, in: *Politiken der Medien*, ed. by D. Gethmann/M. Stauff, Zurich/Berlin: diaphanes 2004, pp. 131-154.

(Mühlmann 1998: pp. 106) This episode is memorable because it implies that the cybernetic has to be killed in order for the story to come to a happy ending – an ending of the greatest political significance, since Aeneas' fate is almost identical to the fate of Rome, which, in turn, is the fate of the world. So it is all the more remarkable that the best governor has to fail in order to ensure the most favorable course of events. At least that is how things were looking for cybernetics in an age when the Gods were still planning a history which does not control itself by contingency.

In the following, I would like to tell the exemplary story of a modern Palinurus – a political helmsman and cybernetic in a world mostly deserted by gods. Again, it involves a double figure of politics and technology: What we are dealing with is the question of how to avert adverse developments and to alter the course of history in the most positive way possible, with the means of knowledge and intervention on which these defensive measures are based being given and limited by the most recent digital technology.

*

Stafford Beer, the hero of this both memorable and forgotten story, was a figure »larger than life«, a mixture of socialist dandy and enthusiastic engineer. Born in 1926 as the son of a British statistician, he studied psychology and philosophy and came to be one of the most demanded management consultants. Beer streamlined steel, shipbuilding, and railway companies on various continents, directed the world's biggest civil operations research center, developed the first electronic typesetting systems, and the first networked data service for stockbrokers; on the side, he painted in oil and wrote immortal poetry like »The Cost Benefit Analysis Song«. The visions he enfold in his famous book *Cybernetics and Management* (Beer 1962) also move in the borderland between *science fiction* and *science fact*. One can gather from these visions what the glorious era of cybernetics was once dreaming of. Namely, first, that »intelligence amplifiers« with an IQ of one million were soon to come, who alone would be capable of solving the problems of the world. And second, that big companies were like organisms, with their nervous system being the communication and their brain being the management. After all, the goal of each organism is survival, even if the short-term ways to reach it are always »contradictory« (Beer 1962:162). Nature ensures this survival by an abounding variety of mutation and adaptation. However, since economies do not have the time for that, much faster computing operations are necessary in order to maximize death and only thus optimize life at the same time. The new electronic brains were supposed to evolve to mutation consultants and selection amplifiers in the economic struggle for survival, and to grasp the »inexhaustible uncertainty of its [the company's] history« (Beer 1962:179).

A good four years later, such an uncertainty called Stafford Beer to the other end of the world, more precisely, to Chile, where in 1970 Salvador Allende had become president and the situation was more than critical. It was this political and economical instability that Fernando Flores, who was a cyberneticist himself and later to become the Chilean minister for economic affairs, saw as the ideal field for the new cybernetic epistemology, and so he invited Stafford Beer to Santiago in the summer of '71. They soon agreed that a »peaceful road to socialism« (Beer 1981:248) could only be found by controlling the national economy through electronic media, and wrote a paper entitled *Cybernetic Notes on the Effective Organization of the State* (Beer 1981:249). Hence, at this very moment in history, when the Western technologies increasingly stopped chanting the cybernetic poetry, having already founded a prosaic computer science instead, this poetry was to occupy Chile as a factual fiction.

In this turn, cybernetics, after numerous technical details and airy dreams, had finally returned to its own history, which had begun as politics. Because from Plato and Aristotle to Hippolytus and Thomas Aquinas, cybernetics has entered modernity as a political occupation, as a good rule of a good ruler. It still appeared that way for electro physicist André-Marie Ampère in the 19th century, when it was responsible for a field combining a totality of governmental tasks and allocating to the state the function of a general regulator. (Ampère 1843) Ampère's cybernetics, *firstly*, aims at an extensive knowledge survey, by which the state defines itself as a database of the characteristics of a country, its population, and the relations between people and

things. *Secondly*, it is a form of intervention to eliminate perturbations and pursue improvements by forms of indirect governing. And *thirdly*, the measure of this controlling is given by the adjusting variable of a prosperity that the state's common rules of behavior are adapted to. Thus, attention by the authorities is combined with the idea of continual control, and this is combined with a policy that is committed to maintaining both individual and common welfare. (Vogl 2004)

All this still holds true for the Chilean government installed by Stafford Beer – though on the media technology level of 1971 and under revolutionary conditions. What this means is, above all, that time is critical. Paper based forms of survey and administration of knowledge, statistician's son Beer argues, are much too slow to be the basis for intervention. For when there is fluctuation in the level of economic activity and the economic data have a delay of at least half a year, statistics, in the worst case, is to reality as cosine is to sine. It recommends increase where decrease is needed and vice versa. Thus, in order for a cybernetic, self-regulating government to work, studying and intervening must get into a time critical relationship with each other; and this can only be achieved by use of electronic media. The state needs new hardware and software for the beginning era of »Real Time Control«. ² They will automatically look for steady states, homeostases, in which parts of the system mutually compensate for other parts' capability to get the whole thing out of balance. Permanent restlessness or destabilization of the system form the productive core of what is at the same time permanently compensated and counterbalanced by effective self-regulation. According to Beer, this would overcome the doctrines of centralization and decentralization, of free market economy and planned economy, and the experts' reports of bureaucracy and nepotism.

The electronic revolution will thus become a portent for the future of revolutions, in fact, the last revolution, which does not start with political concepts but with the infrastructure. A so-called *Cybernet* was developed via requisitioned telex and radio connections from Arica to Puerto Mont. Its data channels extended radially from a computer system named *Cybersyn* to the factories and companies of the land. Hence, the knowledge, in which, according to Ampère, the self-knowledge of the state manifests itself, arrived at all times up-to-date at the central computer in Santiago, which was installed, of all places, at the deserted editors' offices of *Reader's Digest*. Such »polling«-technologies had already been very well tested in the monumental US early warning systems that connected the radar sensors along the coasts with the mainframes in the hinterland. Their control rooms were usually called *Operations-Rooms* (or *Opsrooms*), and this is exactly the name Stafford Beer was to give to his cybernetic government room.

This new *Opsroom* (designed by Gui Bonsiepe) has a strange radiance to it. There are no people in it, and although it exudes a certain desertedness, everything seems as if prepared for a chymical wedding of man and machine. Its ambience is a mixture of office and spaceship, of lounge and engine room, and possesses a certain dream density. There are no red flags, nor any other political insignia. What prevails is the absence of the symbolic, which in itself seems to be symbolic. If cybernetics was a reconciliation dream (of labor and capital, of people and government, of living things and machines), then this is its reconciliation room. On seeing the

2 Such notions were not unusual in the 1960s. Along the same lines, Pierre Berteaux remarked in an exquisitely and interdisciplinarily composed discussion group as early as 1963: »The crucial problem of statistics is its actualization. The consistent information upon which decisions are made will have to be as up-to-date as possible. This actualization, which is a major key to avoiding economic crisis in the industrial society, can only be achieved by means of an enormous investment in computers and calculating machines, and by reorganizing the entire governmental apparatus in the form of a state machinery. There is a fitting French proverb that says: »Gouverner c'est prévoir.« The art of governing is the art of foreseeing. However, the dimension of the future is hard to grasp for humans, for their organic, cerebral thought, for their thinking in words, because the brain is not able to survey at once the countless elements that affect events. [...] Man ist future-blind by nature. This fact can be solved by the machine.« *Maschine – Denkmaschine – Staatsmaschine*, 9. Bergedorfer Gesprächskreis, protocol (typescript) of 25.02.1963.

photograph for the first time, one would probably suspect the set of a science fiction movie. Kubrick's 2001 was only three years ago, Faßbinder's *Welt am Draht* (*World on a Wire*, based on the novel »Simulacron« by Daniel F. Galouye) was to come out in the following year – in both movies computers take over the government. *Science fiction* and *science fact* were moving in the same fixtures and fittings. And when, later, Stafford Beer writes that the rest of the world (the US, the CIA), was the reason for the failure, one can really imagine this room blast off into the lonesome void of the universe.

The design of the *Opsroom* had to solve a variety of problems. *First*, the amount of continually collected knowledge had to shrink to »human proportions« (Beer 1973:21). For the eyes of the users, there has to be a function that allows them to know everything the computer knows, if needs be, but to forget most of it, most of the time. Hence, the new computer politics demanded a forced organization of ignorance in order to be able to function in the first place. *Second*, user interfaces had to be designed that could be »intuitively« understood. »If »participation« has any meaning,« Stafford Beer writes, »no one must be disbarred because of an inadequate grasp of jargon, of figure-work, of high-level rituals. As I have told you before, the workers themselves must have access to the whole of this.« (Beer 1973:20) *Third*, »paper is banned from this place.« (Beer 1973:21) The *Opsroom* is to be a »decision machine«, where human beings and equipment are in a »symbiotic relationship« (Beer 1973:21) in order to increase their different strengths, and to unite them in a new synergy of enhanced intelligence.³ And for that they need information.

The four screens on the right form the system's database, which (in spite of its resemblance with terminals) is actually built with hidden slide projectors, remotely controlled via the buttons in the armrests of the armchair. The chart left of the middle shows a recursive interlacing of systems and subsystems, by which every point and level of economy can be observed. Should the computer encounter any problems in a subsystem (say, in a factory), a warning light starts flashing, and (with due delay) the next highest level (say, the parent company) is informed. This »algedonic« (pain) signal (Beer 1973:16), which can cause breaches in the autonomy, is the productive center of the computerized regulation. It is therefore no coincidence that the underlying data is mathematically calculated like stock exchange indexes, who in turn are pursued with procedures from the field of early warning systems. The two screens on the outer left are supposed to provide an interactive surrounding (which has never been completed), where changes in the system (production processes, transport routes, prices, etc.) can be made and simulated with real data, in order to avoid too frequent pains in the body politic. Finally, the bar charts in the middle visualize Beer's Leibizian distinction between potentiality and actuality – i.e., what a system actually performs and what it could perform. Strikingly, »potentiality« has been translated as »futuro« here. While for Leibniz the real world still coincided with the best one, with the entry of electronic media it is carried away to the future and yet right at hand at the same time. It becomes the aim that »one« (i.e. the governing computer) keeps an eye on on the fly.

However, it is part of Beer's social utopian project that the governed ones are not just pawns in a game, but become players themselves. If the »revolution of the government« is to start at each single individual, then this also requires a media technical infrastructure that anticipates, with the means of 1970, what is in great demand again today, from *e-government* to talent competitions. The interplay of people, television, and government opens what Beer himself called »psycho cybernetics« (Beer 1981:278). And here, too, we are dealing with time and communication. On the one hand, the traditional proceedings of parliamentary representation, of bureaucracy and terms of office are much too slow for the cybernetic era; on the other hand, classical mass media like newspapers, radio, and TV do not have a back channel for a feedback

³ The notion of symbiosis was probably inspired by Joseph C.R. Licklider's famous essay »Man-computer symbiosis«, in: *IRE Transactions on Human Factors in Electronics*, HFE-1 (1960) p. 4-11. Licklider, who was then still working as a Psycho-Acoustic, was one of the participants at the Macy-Conferences on Cybernetics.

signal. Sluggishness and »false dialogue« (Beer 1981:280) threaten the balance of the state and lead to agitation, violence, and revolt. Beer's proposal, which might refer to Brecht (but actually originates in the public opinion research of Paul Lazarsfeld), turns responsibility into answering in real time (Peterman 1940; Hollonquist /Suchman 1979).⁴ While still at home, following the parliamentary debates on their TV sets, people can already turn a satisfaction switch (labeled »happy«/»unhappy«). The voltages are transferred via the telephone network, averaged, and immediately inserted as bar charts into the speaker's monitor. This starts a circulation: the politician knows that the people know that he knows. And the people know that the politician knows that the people know that he knows... Good politics is giving the people a good feeling – a feeling of giving it a green light, if it already has color TVs. Governing and »instant market research« simply coincide in this new public. The happy population is a happy customer. Such a structure, Beer concludes, would organize entirely new relations of the individual and the whole, of personal and collective decision, of freedom and functioning.

The real time of electronic media that marks this new field of the psycho-cybernetic government lets something like 'statehood' become fragile. It causes a limit loss of the political – an extensive, wavy registration of the person opposite, and a will to know that leaves nothing out and knows no end of interest. The »occasional« (Carl Schmitt) becomes the center of the political. Needless to stress that the charts of happiness were to be broadcasted live to the *Opsroom*, and that similar feedback loops were to be installed in factories, in order for the workers to be able to observe themselves, the bosses to observe the workers, the workers to observe the bosses, and the bosses to observe the bosses. For the eudaemonist Beer, this mirror maze of observation, this uninterrupted relationship controlling, which elsewhere (though at the same time) has been called »societies of control« (Deleuze 1993), was a promise of happiness. Freedom, according to Beer, is not a normative question, but »a computable function of effectiveness [...] the science of effective organisation, which we call cybernetics, joins hands with the pursuit of elective freedom, which we call politics (Beer 1973:16,23).

Although Allende was in fact able to inaugurate the *Opsroom*, the 'uncertainty of history' is known to have come to an end that was not free, but bloodstained; not autopoietic, but military; not cybernetic, but hierarchic. Stafford Beer renounced all material possessions in 1974, and lived for a decade as a hermit in a stone hut in Mid-Wales.

In Heiner Müller's play *Der Auftrag*, which is about the failing export of another revolution, a nameless and harassed voice on the desperate way to its boss (the »Number One«) whispers the non-question: »How do you carry out an unknown order?« (Müller 1988:438) If this is an allegory of Stafford Beer's cybernetic experiments in Chile, it must include a Number One who knows the order. Hence, the US were fully aware of the aims of their intervention policy, and had similarly strong interests in cybernetics as a power of small interferences with huge effects. However, what was at stake when authorities like the CIA or ARPA, SORO or RAND simulated economic processes as calculable ones, was not some unclear common good or hardly foreseeable »happiness«, but, rather concretely, a possibility to systematically counteract or selectively force revolts. (Pias 2002; Holl 2004) The CIA didn't even need to send particularly many agents to Chile: in the so-called *Project Camelot*, they simply analyzed the studies of thousands of academic sympathizers, who had gone to Chile in order to help, without suspecting that their observations would end up in the computers of the secret service. (Horowitz 1967) Here, they also ran a computer simulation that went by the beautiful name of *Politica Game*, whose algorithmic ratio held that even an American attempt on Salvador Allende's life was by all means worth considering. So, behind the struggle of two cybernetics we may well recognize the struggle for the media technical and epistemological standards of a politics that is able to deal with »increasingly new tumultuous situations« (Carl Schmitt) of

⁴ Lazarsfeld was present at the founding conferences of cybernetics, and his method was so universally applicable that it was also used with Vietnamese POWs at the same time so that the computer of the RAND Corporation would then be able to calculate the most favorable course of the war. (Pias 2004b).

raging social contingency; a politics that, in doing so, responds to the epitome of the non-political, and that today is hiding everywhere behind the zealous showing of intensive political distinctions.

*

A lot more could be said about the events in Chile⁵, but let me confine myself to three remarks on the question of defense.

Herman Kahn, probably one of the most important thinkers of defense, once stated, »war is a terrible thing, but so is peace« (Kahn 1961:228). The Cybernetic Government implies – as does life itself, according to Beer – a kind of permanent border war between improbable order and most probable disorder, in order to ensure the integrity and constancy of the body politic. The point is here, I think, that – either because of the complexity of the object itself or because of the possibilities of knowledge changing with the media – it is never quite clear which place exactly is threatened, what exactly the threat consists of, and what are the appropriate measures of defense. Basically, however – and this is what the utopia of cybernetic governments is all about – it is needless to know, since ›intelligent‹ cybernetic infrastructures or systems possess such enormous plasticity (at least, this is what their developers hope) that they are able to optimally adapt to each unpredictable situation. One might recall here Stafford Beer's early experimental set-ups, where children, or even mice, were to solve differential equations without knowing it, because there was so much intelligence within the system (Pickering 2002). Defense becomes fluid by adapting to a contingent history that is at the same time controlled and produced by cybernetic environments.

This fact radicalizes the question of the observation of defense. In my example, everything can become a defensive action as well as its opposite, depending on the systematic context. The broadcasting of two additional hours of daily soaps per week might be regarded as a defensive action just as the airing of two hours less. Increasing steelworkers' incomes might be a defensive action as well as decreasing them, and so on. It all seems to depend on the state of the cybernetic system, its history, the resolution of data, and the complexity of models and submodels. An ideal cybernetic system would be able to utilize almost every kind of intervention in order to defend its stability, or ›life‹. And this could be seen as a link to psychoanalysis where, according to Anna Freud, quite different psychic processes can serve the purpose of defense – i.e., repression, regression, undoing, projection, idealization, and so on might all be used as mechanisms of defense on different levels. So, in both cases we are dealing with a concept that is becoming operational only in detail, because quite heterogeneous measures can be used for defense.

At least cybernetics itself as a science was in a defensive role at that time. After losing a great deal of its fascination during the first decades and proving its inability to fulfill most of its high promises, the academic discipline of computer science (in Germany called Informatik, following the French *science informationelle*) was founded at several universities around the mid-sixties. (Coy 2004) Its claim was simply to educate engineers for solving problems concerning computerization and thus answering the increasing demands in business, industry, and administration. So, computer science reduced or devoted itself to the development of hard- and software and explicitly defined itself against the cybernetic dreams of reconciliation, of a new universal science, of a new philosophical ontology, and of a new politics.

In fact, Palinurus can fall into the water in many ways.

⁵ Currently, a reviewing of these events is taking place at different places which can be expected to reveal some new sources. In Germany, an MA thesis has recently been completed (Sebastian Vehlken, Ruhr-Universität Bochum, 2004), Diana Mincyte is currently doing research on Stafford Beer at the University of Illinois, and a dissertation by Eden Miller is announced for 2005, entitled »The State Machine: Politics, Ideology and Computation in Chile, 1964-1973«.

References

- Ampère, André-Marie (1843), *Essai sur la philosophie des sciences ou exposition analytique d'une classification naturelle de toutes les connaissances humaines*, seconde partie, Paris: Mallet-Bachelier
- Beer, Stafford (1962) *Kybernetik und Management*, Frankfurt a.M.: Fischer [Cybernetics and Management, London: English Universities Press 1959]
- Beer, Stafford (1973) *Fanfare for Effective Freedom. Cybernetic Praxis in Government* (= The Third Richard Goodman Memorial Lecture, Brighton 14.2.1973; zitiert nach der online-Fassung unter www.staffordbeer.com)
- Beer, Stafford (1981) *Brain of the Firm*, Chichester: Wiley (2nd edition)
- Coy, Wolfgang (2004) »Zum Streit der Fakultäten. Kybernetik und Informatik als wissenschaftliche Disziplinen«. In: Pias (2004a), pp. 253-262
- Deleuze, Gilles (1993) »Postskriptum über die Kontrollgesellschaften«. In: *Unterhandlungen 1972-1990*, Frankfurt/M., pp. 254-262
- Galison, Peter (1994) » The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision«. In: *Critical Inquiry*, 21, pp. 228-266.
- Herman, Ellen (1998) »Project Camelot and the Career of Cold War Psychology«. In: Ch. Simpson (Ed.) *Universities and Empire: Money and Politics in the Social Sciences During the Cold War*. New York: The New Press
- Holl, Ute (2004) »It's (Not) an Intervention!« Kybernetik und Anthropologie«. In: Pias (2004a), pp. 97-114
- Hollonquist, Tore / Suchman, Edward A. (1979) »Listening to the Listener. Experiences with the Lazarsfeld-Stanton Program Analyzer«. In: Paul F. Lazarsfeld / Frank N. Stanton (Hg.) *Radio Research 1942-43*. New York: Arno Press, pp. 265-334
- Horowitz, Irving Louis (1967) (Hg.) *The Rise and Fall of Project Camelot: Studies in the Relationship between Social Science and Practical Politics*. Cambridge, Mass.: MIT Press
- Kahn, Herman (1961) *On Thermonuclear War. Three Lectures and Several Suggestions*, Princeton: Princeton University Press
- Mühlmann, Heiner (1998) *Kunst und Krieg. Das säuische Behagen in der Kultur*. Köln.
- Müller, Heiner (1988) »Der Auftrag«. In: Ders.: *Stücke*. Berlin: Aufbau
- Peterman, Jack N. (1940) »The ›Program Analyzer‹. A New Technique in Studying Liked and Disliked Items in Radio Programs«. In: *Journal of Applied Psychology*, 24/6, pp. 738-741
- Pias, Claus (2002) *Computer Spiel Welten*, Munich: sequenzia
- Pias, Claus (Ed.) (2004a) *Cybernetics – Kybernetik. Die Macy-Konferenzen*, vol. II: *Essays und Dokumente*, Zurich/Berlin: diaphanes
- Pias, Claus (2004b) »Mit dem Vietcong rechnen. Der Feind als Gestalt und Kunde«. In: E. Schüttpelz (Ed.) *Freund, Feind & Verrat. Das politische Feld der Medien*, Cologne: DuMont, pp. 157-183
- Pickering, Andrew (2002) »Cybernetics and the Mangle: Ashby, Beer and Pask«. In: *Social Studies of Science*, 32, pp. 413-438
- Pircher, Wolfgang (2004) »Markt oder Plan. Zum Verhältnis von Kybernetik und Ökonomie«. In: Pias (2004a), pp. 81-96
- Vogl, Joseph (2004) »Regierung und Regelkreis. Historisches Vorspiel«. In: Pias (2004a), pp. 67-80

Translated into English by Frank Born

Captions:

Figure 1: The schedule for the cybernetic rescue of Chile by the project »Cybersyn«

Figure 2: Critique and crisis – economic cycles and the knowledge about them as temporally shifted oscillations

Figure 3: The Opsroom in Santiago

Figure 4: The database of the Opsroom (outline by Stafford Beer)

Figure 5: Typical »displays« – on the left an index, on the right a bar chart that compares past and future

Figure 6: Government and regulation between »Happy« and Unhappy« (outline by Stafford Beer)

Figure 7: The utopia of the cybernetic Government (drawing by Stafford Beer for the never published brochure »Towards Good Government«)